eration of the Provincial Department of Agriculture, is due the fact that the Pacific province has now a very large number of meteorological stations.

The immense territory covered by the Canadian Meteorological Service demands a correspondingly large number of voluntary and regular stations, in order to properly present its climatology in relation to agriculture, forestry, hygiene, and all human industries. A few such enterprising men as Mr. Baynes Reed, in charge of the respective divisions of the Canadian Service, would accomplish all that it is possible to do for the climatology and meteorology of the Dominion. Observers, clerks, computers, and forecasters, all alike feel the stimulating influence of an energetic chief.

Our readers will be interested in the short description of the general organization of the Canadian Service, published on a preceding page, from the pen of Prof. R. F. Stupart, who has been Director of the Canadian Service and Superintendent of the Magnetic Observatory at Toronto, since January, 1895, after a previous service of several years, first as assistant and then as acting director during the illness of his predecessor, Professor Carpmael, who died in October, 1894.

"SCIENTIFIC AIDS" IN THE DEPARTMENT OF AGRICULTURE.

Doubtless there are many observers in the Weather Bureau, both regular and voluntary, who have studied at agricultural colleges, experiment stations, or land grant colleges, and who will be interested in the following letter from the Honorable Secretary of Agriculture and the circular of the United States Civil Service Commission, which we publish in full.

In this letter our readers now have a statement from the highest authority as to the needs of the various bureaus of the Department of Agriculture, and will perceive the importance of the step that has been taken to educate men competent to give satisfactory service. The Department includes workers in every branch of biology and physics, and even mathematics; men who have to apply their knowledge to meteorology, the diseases of animals and plants, the cultivation of the ground, the manufacture of the completed product from the crude material, the irrigation of dry land, the construction of roads, the proper handling of statistics, and many other practical matters.

We can but believe that the Secretary has taken the very best possible way to secure able men and educate them to the special work of his broad service. It is a long step toward realizing that ideal "University of the United States," and the educational system to which we alluded on pp. 63, 64, 548, and 564 in the MONTHLY WEATHER REVIEWS for February and December, 1898.

(Copy P.)

UNITED STATES DEPARTMENT OF AGRICULTURE,
OFFICE OF THE SECRETARY,
Washington, D. C., June 10, 1899.

Hon. JOHN R. PROCTER,
President Civil Service Commission,
Washington, D. C.

DEAR SIR: In my report to the President of the work of this Department for the year ending June 30, 1898, I proposed that the Department should receive from time to time graduates of agricultural colleges, who should come to work in the scientific Divisions of the Department, and at the same time pursue post-graduate studies, thus taking advantage of the facilities which the Department has for advanced study and fitting themselves for posts of usefulness in the Department, agricultural colleges, experiment stations, and other institutions throughout the country requiring the services of persons able to make original researches in lines related to agriculture. This plan met with much approval from the officers of the agricultural colleges and experiment stations and others interested in the advancement of agricultural science and practice in this country, and I therefore wish to put it into actual operation as far as existing conditions in the Department will permit.

In order to have a permanent arrangement for the registration of graduates of colleges desiring to enter the service of the Department as scientific aids, and to furnish a proper basis for the selection of candidates best fitted to meet the needs of the Department for assistance in different lines of scientific work, I respectfully request the Commission to establish a register of "Scientific Aids" for this Department on the following basis:

1. That the candidates be limited to graduates of colleges receiving the benefits of grants of land or money from the United States.
2. That each candidate file with the Civil Service Commission a properly certified statement as to the length of time spent in college, the studies pursued, the standing in these studies, the special work it is desired to take up, and the special qualifications for such work, and finally a thesis upon such special scientific subject as the candidate may select, or in lieu of this any literature on scientific subjects published over his own signature.
3. That the weights for the aforesaid evidences of qualifications be arranged on the following basis: College course, with Bachelor's degree, 50; post-graduate course and special qualifications, 25; thesis or other literature, 25.
4. That the length of time any "Scientific Aid" may serve in the Department be limited to two years.
5. That the salary shall not exceed $40 per month.
6. That an eligible register of "Scientific Aids, Department of Agriculture," be kept by the Commission and be open to inspection of the Department officers, as in the case of the list of "Assistants, Department of Agriculture."

I desire that this plan, when approved by the Commission, shall be put in operation without delay, and for this purpose request that you will send me 100 copies of such public notice as you send out regarding the establishment of this register, in order that I may transmit it to the presidents of the colleges concerned, with a statement of the needs and limits of the Department in the employment of their graduates in this way.

Very respectfully,
(Signed) JAMES WILSON,
Secretary.

Series No. 1. Sheet 1.
June, '99.

UNITED STATES CIVIL SERVICE COMMISSION.

DEPARTMENTAL SERVICE—SCIENTIFIC AID EXAMINATION.

DEPARTMENT OF AGRICULTURE.

Competitor must fill these blanks. Name ..... P. O. address .....
County ..... State .....

(N. B.—The competitor will not write in the form below.)

REPORT OF MARKS.

WASHINGTON, D. C., ——— —, 189–.

Subjects.	Averages.	Relative weights.	Products of averages multiplied by weights.
First—College course with bachelor's degree..		10	
Second—Post-graduate course and special qualifications		5	
Third—Thesis or other literature		5	
Total		20	
General average			

Avoid all allusions to your political and religious opinions or affiliations in any material which is submitted with this sheet.

Competitors will not be assembled for any of the tests.

PRELIMINARY QUESTION.

Give the names and addresses of five persons (not relatives) who have a personal knowledge of your educational and special qualifications and who will answer questions regarding them.

FIRST SUBJECT—COLLEGE COURSE WITH BACHELOR'S DEGREE.

Furnish a certified statement from the proper college or university officer relative to any diplomas or certificates of graduation you have received conferring scientific, literary, or other degrees, and stating fully the length of time spent in the college, the studies pursued and the standing in these studies.

SECOND SUBJECT—POST-GRADUATE COURSES AND SPECIAL QUALIFICATIONS.

Make a complete statement of any post-graduate course you have pursued or work you have done. State particularly any special qualifications you possess which in any way fit you for the duties of scientific aid and the special work you desire to take up.

THIRD SUBJECT—THESIS OR OTHER LITERATURE.

Submit a thesis of not less than 2,000 words on any scientific subject, or, in lieu thereof, any other literature or publications on scientific subjects which you have prepared.

JURAT.

(The following oath must be taken before a notary public or other officer authorized to administer oaths for general purposes, and the officer's signature must be authenticated by official seal. If the oath be taken before a justice of the peace or other officer who has no official seal, his official character must be certified by the clerk of the court, secretary of state, or other proper officer, under official seal.)

I, the undersigned, do solemnly swear (or affirm) that in the preparation of the accompanying thesis, or other literature required under subject three, the composition is entirely my own, and that I have given full credit, by quotation marks or references, to authorities for any quoted matter.

(*Signature of competitor:*) ——— ———.

Subscribed and sworn to before me by the above-named applicant, to me personally known, this ——— day of ———, 189–, at ———, county of ———, and State [or Territory or District] of ———.

(*Signature of officer:* ——— ———.

[OFFICIAL SEAL.] (*Official title:*) ——— ———.

The official seal must not be omitted.

RECORDS BY THE MILNE SEISMOGRAPH.

On Plates V and VI we have reproduced a number of facsimiles of the records made by the Milne seismographs that are established and kept in working order by the Canadian Meteorological Service at its stations in Toronto and Victoria, B. C. It is very much to be hoped that similar apparatus will be established at a few places in the United States for the purpose of tracing the progress of the undulations that run around the whole globe whenever an earthquake of any importance occurs. If it were desired to investigate the phenomena of the smaller local earthquakes an instrument of different pattern and more numerous stations would be required. Studies of this local nature have been already undertaken in many countries, but the establishment of the Milne apparatus, which is now set up at about twenty stations, is in accordance with an international scheme which looks to the study of the exceedingly minute oscillations that extend to great distances from any center. Both the general and the local disturbances must be studied in order to prepare the way for any system of forecasting earthquakes, or the erection of earthquake-proof buildings and monuments. There can be no doubt but that seismic disturbances originate in a variety of ways and have a corresponding variety of phenomena. When an eruption is about to occur from a volcano there are short severe shocks in rapid succesion, comparatively near the surface and not liable to be felt many miles away. When the general geological strata are strained and eventually crack, and slide over each other, a slower dislocation, or so-called fault, is produced. This involves the movement of a large mass, oftentimes at considerable depths in the earth, and the disturbance or wave of shock may be felt for several hundred miles, while a gentler wave or oscillation may run entirely around the globe, and, perhaps, even several times around. When such a wave passes a distant station, it simply produces at the surface of the ground a slight undulatory movement, although far beneath the surface the movement may be one of compression and rarefaction. The Milne seismograph is adapted to record this gentle undulation or tremor, by which the surface and all objects standing upon it are slowly tipped forward and backward as the successive waves pass by the spot, for it generally happens that a single wave can not travel alone, but is preceded and followed by smaller waves, so that the whole series forms a group. Our diagrams show such groups of waves on January 24, April 16, June 4, 5, and June 14, all in the present year.

The apparatus with which these records are made is called the horizontal pendulum seismograph. It was invented by Prof. John Milne, and general descriptions of its construction, as well as of the work done by the British Association for the Advancement of Science, through its various committees on seismological observations, are given in successive annual reports of the Association, especially those for 1896–97–98. Some idea of the apparatus is given by fig. 1, in which we see that when the horizontal beam, technically called a boom, which is made exceedingly light and is about 30 inches long, remains stationary, then the light of the lamp reflected downward from the mirror is photographed upon a strip of paper that is moving slowly along below it. This is the central black line shown on Plates V and VI. If the supporting stand is disturbed, the longer end of the boom oscillates horizontally like a pendulum, producing the broadenings of this line. The boom gradually comes to rest and so remains until another disturbance occurs, and the line again broadens. Our illustrations show that the shocks come sometimes in such rapid succession that the boom has no chance to come to complete rest between each shock; thus an earth tremor can usually be analyzed into a series of increasing and decreasing oscillations.

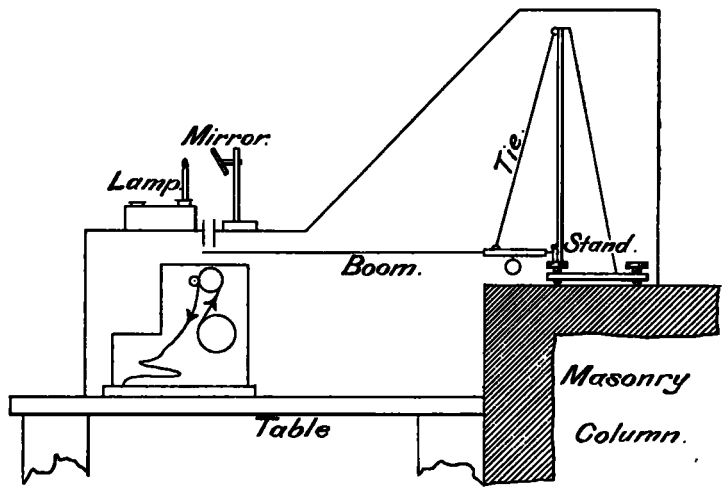

FIG. 1.—Milne horizontal pendulum seismograph.

When the Milne apparatus is first set up there is apt to be need of adjustment almost daily, owing to the fact that the masonry column and the soil beneath it is undergoing a slight progressive change. It takes a long time for a newly built column to come into a permanent quiescent state. Again, there are many localities in which the geological strata are apparently undergoing a slow progressive deviation from horizontality. Mr. Milne mentions such in the Isle of Wight, where the shocks are too local in their character to be called earthquakes. Mr. G. K. Gilbert, of the United States Geological Survey, has argued with some plausibility that the whole region of the Great Lakes is being slowly canted toward the south-southwest (see MONTHLY WEATHER REVIEW, April, 1898, p. 164), at a rate which he expresses in inches, for a base line of 100 miles, but which may also be expressed in angular measurement, and is equivalent to a rate of 0.15 seconds of arc in a hundred years at the slowest, and 0.50 seconds at the fastest. Even this exceedingly slow movement could be made appreciable to a Milne seismograph, which is ordinarily so adjusted that half a second of arc corresponds